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CAPABILITIES OF THE ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY-LAS VEGAS

Environmental Monitoring and Support Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Las Vegas, Nevada 89114

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CAPABILITIES OF THE ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY-LAS VEGAS

by

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U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
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LAS VEGAS, NEVADA 89114

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16. ABSTRACT

This report describes the present and developing capabilities of the U.S. Environmental Protection Agency's Environmental Monitoring and Support Laboratory in Las Vegas, Nevada. Its purpose is to present comprehensive information in concise form to enable users of the Laboratory's services to more readily determine the types of technical support available.

The Laboratory's present capabilities were developed through performance of research and monitoring projects involving large and small animal studies; studies of vegetation and soil; development and application of techniques for monitoring of air, water, and land; analytical studies, and quality assurance activities. The data show a 5-fold increase in budget from 1971 to 1976. Whereas 77 percent of its resources were spent in radiation projects in Fiscal Year 1971, only 31 percent of its Fiscal Year 1976 funds were devoted to radiation studies.

Indexed tables list the present capabilities by environmental medium and by pollutant. These are referenced to scientific and technical reports published or presented by Laboratory personnel.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Biochemistry Biology Chemical analysis Civil engineering Quality assurance	Environmental measurements and monitoring Technical support	06 A, B, F, R, T 07 B, D 13 B 14 B, D

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FOREWORD

Protection of the environment requires effective regulatory actions which are based on sound technical and scientific information. This information must include the quantitative description and linking of pollutant sources, transport mechanisms, interactions, and resulting effects on man and his environment. Because of the complexities involved, assessment of specific pollutants in the environment requires a total systems approach which transcends the media of air, water, and land. The Environmental Monitoring and Support Laboratory-Las Vegas contributes to the formation and enhancement of a sound integrated monitoring data base through multidisciplinary, multimedia programs designed to:

- develop and optimize systems and strategies for monitoring pollutants and their impact on the environment
- demonstrate new monitoring systems and technologies by applying them to fulfill special monitoring needs of the Agency's operating programs

This report describes the present capabilities of the Las Vegas Laboratory, the kinds of activities through which these capabilities were developed, and the resources applied to their development. An indexed table is provided so that potential users of the Laboratory's services, primarily the Regional and Program Offices of the U.S. Environmental Protection Agency, can readily determine the types of technical support available. Also included is a resume of existing programs which will indicate the capabilities being developed by the Environmental Monitoring and Support Laboratory-Las Vegas.

George B. Morgan

George B. Morgan
Acting Director
Environmental Monitoring and Support
Laboratory-Las Vegas

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INTRODUCTION

The U.S. Environmental Protection Agency's Environmental Monitoring and Support Laboratory in Las Vegas, Nevada, has been involved in research, monitoring, and technical support to other Federal groups and State government agencies since 1959. Until 1970, it was a part of the Public Health Service in the U.S. Department of Health, Education, and Welfare and was engaged in environmental radiation programs. When the Environmental Protection Agency came into being on December 2, 1970, the Las Vegas Laboratory became a part of that new Agency.

Since that time, the Laboratory's focus, capabilities, and programs have broadened in scope. Its resources have increased by almost a factor of 5, and the new funds have been applied almost exclusively to research, demonstration, and technical support projects which expanded the Laboratory's capability for accurate monitoring and measurement of pollutants and assessment of their impact on the environment.

Changes in the Laboratory over the past 6 years have been accompanied by three changes in its name which reflect the shift in focus and the broadened scope of its scientific and technical programs. These name changes and the Laboratory's resources are listed in Table 1 by Fiscal Year. The abbreviations listed with the names aid in identifying technical reports issued under the various designations, e.g., SWRHL-90r, NERC-LV-539-1, etc. In Table 2, the sources of funds and their primary applications are shown, again by Fiscal Year.

TABLE 1. NAMES AND RESOURCES OF THE LAS VEGAS LABORATORY

FY	Laboratory Name	Positions Perm.	Positions Other	Funds ($K)
1970	Southwestern Radiological Health Laboratory (SWRHL) until May 21, 1971	178	10	2,475
1971	Western Environmental Research Laboratory (WERL)	226	14	3,357
1972	Western Environmental Research Laboratory (WERL) until July 17, 1972	215	28	3,670
1973	National Environmental Research Center-Las Vegas (NERC-LV)	198	64	5,280
1974	National Environmental Research Center-Las Vegas (NERC-LV)	237	77	6,990
1975	National Environmental Research Center-Las Vegas (NERC-LV) — until June 29, 1975	229	90	10,950
1976	Environmental Monitoring and Support Laboratory-Las Vegas (EMSL-LV) — to the present	214	102	12,390

TABLE 2. SOURCE AND PRIMARY APPLICATION OF FUNDS

FY	Category	EPA Funds ($K) Radiation Projects	EPA Funds ($K) Other	ERDA Funds ($K) Radiation Projects	ERDA Funds ($K) Other	Other Funds* ($K) Radiation Projects	Other Funds* ($K) Other	Total Funds ($K)
1971	Research	263	0	460	0	0	0	723
	Monitoring†	240	565	1,829	0	0	0	2,634
1972	Research	507	0	400	0	0	0	907
	Monitoring†	256	520	1,987	0	0	0	2,763
1973	Research	528	543	415	0	0	0	1,490
	Monitoring†	283	1,418	2,086	0	0	0	3,790
1974	Research	699	1,450	603	0	0	0	2,750
	Monitoring†	329	2,286	1,575	0	50	0	4,240
1975	Research	649	2,675	491	0	0	1,130	4,945
	Monitoring†	305	2,677	1,809	0	204	1,010	6,005
1976	Research	314	2,682	664	0	0	1,153	4,810
	Monitoring†	369	3,656	2,082	0	450	1,022	7,580

*Mostly energy funds.
†Monitoring includes technical support.

PRESENT CAPABILITIES

The resources listed in Tables 1 and 2 were used in applied research and monitoring studies performed in house or under contract to achieve designated Agency goals. The greatest increases in resources were for projects other than radiation research and monitoring, which received only moderate increases from the 1970 levels. Thus, although the capability for radiation-related activities has been maintained, the major development of new capabilities has been in other research and monitoring areas.

The types of studies performed during the past 6 years are grouped below into seven basic categories. These indicate the kinds of research, monitoring, and technical support capabilities which now exist at the Las Vegas Laboratory.

LARGE ANIMAL STUDIES:
- Food-chain transport of materials in dairy and beef animals;
- Uptake and tissue concentration;
- Cronic exposure effects;
- Artificial rumen studies of solubility;
- Milk secretion of substances.

SMALL ANIMAL STUDIES:
- Particle studies in lung;
- Metabolism studies (distribution and excretion);
- Chronic exposure studies;
- Tissue distribution studies.

VEGETATION STUDIES:
- Metabolism and uptake in natural vegetation and economic crops;
- Acute and chronic effects;
- Food-chain transport;
- Soil-to-plant transfer;
- Foliar and root uptake with environmental chamber, glasshouse, and farm plot studies.

SOIL STUDIES:
- Soil chemistry;
- Classification of soils;
- Microbiology.

MONITORING STUDIES:

Optimized monitoring systems;
Biological monitoring techniques;
Integrated monitoring systems design;
Aerial remote monitoring;
Surveys of domestic and wild animals for pollutant burdens;
Environmental radiation surveillance;
Measurement of baseline radionuclide burdens in people living near the Nevada Test Site;
Air --- systems design; new monitoring techniques; particle characterization; specialized remote and in situ techniques;
Water --- systems design; new monitoring techniques; water quality monitoring for surface and ground water; eutrophication assessment; specialized remote and in situ techniques; long-term hydrologic monitoring for radionuclide contamination;
Land --- photographic and satellite multispectral scanner assessments.

ANALYTICAL STUDIES:

Methodology and instrumentation for analyzing radioactive and stable materials in any medium;
Adaptation of advanced techniques to routine laboratory and field use.

QUALITY ASSURANCE (Principally for radionuclide measurements):

Production of reference materials;
Laboratory performance evaluations;
Certification procedures;
Collaborative tests;
Standardized method and reference method development.

INDEX TO CAPABILITIES

To aid the user of the Las Vegas Laboratory's services, a set of indices is provided in Tables 3 and 4. These tables, which list capabilities by environmental medium and by pollutant, are related to Table 5 by specific key numbers. This table provides a brief tabulation of the capabilities and it references scientific and technical reports that describe the studies through which the capabilities have been developed and demonstrated, either in house or by contract. A unique capability is remote and contact monitoring via instrumented aircraft which provides quick response and wide-area coverage.

TABLE 3. INDEX TO CAPABILITIES BY MEDIUM

Medium	Capability	Applications (Key numbers refer to Table 5)
Air	Contact monitoring	airport sources 4 analytical methods 18 by aircraft 2, 7 calibrated gases 9 criteria pollutants 2, 4, 7 geothermal 49 model validation, site specific 6 oxidant transport 2 radiation quality assurance 47 radionuclides 9, 10, 11 radon from mill tailings 39
	Network design	network evaluation 5 oxidant and carbon monoxide 1 trace elements 38
	Remote monitoring	laser 3, 6, 7 opacity 8 photographic 9
Water	Contact monitoring	disposal wells 22 eutrophication studies 45 geothermal 49 groundwater techniques 15 radionuclides 11, 18 radium in public water supply 19 reference methods 17

TABLE 3. INDEX TO CAPABILITIES BY MEDIUM – Continued

Medium	Capability	Applications (Key numbers refer to Table 5)
Water	Contact monitoring (cont'd.)	STORET data analysis 13 surface water problems and techniques 14, 20
	Network design	evaluation of networks 5 groundwater 12 surface water 14
	Remote monitoring	multispectral scanner 21 oil spills 16 water-body size 21
Other	Biological monitoring	analytical methods 18 for metals 38 organophosphates 36 poisonous plants survey 50 radionuclides 11, 37, 43
	Integrated monitoring	theory and applications 38
	Remote sensing	oil spills, land and water 16 vegetation damage 16

TABLE 4. INDEX TO CAPABILITIES BY POLLUTANT

Pollutant	Applications (Key numbers refer to Table 5)
Stable Pollutants:	
Aerosols	generating and assessing, synthetic 43 in boundary layer 7
Cadmium	area balance 38 body burden 38 monitoring 38
Carbon monoxide	monitoring network design 1
Criteria	monitoring network evaluation, air and water 5
Hydrocarbons	airport as source 4 soil and vegetation 4
Hydrogen sulfide	geothermal effluents 49

TABLE 4. INDEX TO CAPABILITIES BY POLLUTANT – Continued

Pollutant	Applications (Key numbers refer to Table 5)
Lead	balance in Los Angeles 38 body burden 38 monitoring 38
Mercury	area balance 38 body burden 38 in man 37 methyl, from plants and soil 44 monitoring 38
Nitrate	control by rubble chimney 20 eutrophication by 45 in lakes 45 reports by State 45
Nitrogen oxide	airport as source 4
Oil	detection in vegetation 16 remote monitoring of spills 16
Opacity	photographic measurement 8
Organics	poisonous plants 50
Organophosphate	biological monitoring 36
Oxidant	formation and transport 2 laser sensing 3 monitoring network design 1
Ozone	(see oxidant)
Particulates	in boundary layer 7 lidar detection 7
Pesticide	organophosphate biological monitoring 36
Phosphates	eutrophication by 45 in lakes 45 reports by State 45
Sand	in ruminant gastrointestinal tract 35
Sulfur oxides	laser monitoring 6
Trace elements	analytical methods 18 groundwater network design 12 oil shale, coal and mineral sources 15

TABLE 4. INDEX TO CAPABILITIES BY POLLUTANT – Continued

Pollutant	Applications (Key numbers refer to Table 5)
Trace elements (cont'd.)	problems and techniques 14 rapid analysis, STORET data 13
Waste disposal	monitoring disposal wells 22
Radioactive Pollutants:	
Alpha emitters	reference method, water 17
Americium	bibliography 40 in chicken, egg 23 in mammals, cattle 28, 30 in milk 30 in plants 40 in rumen 26 in soil 40
Argon	monitoring in air 9
Beryllium	in cow and milk 30
Beta emitters	reference method, water 17
Cesium	analysis 18
Curium	in goat and milk 30
Gamma emitters	effects 28, 31 fission products in hamster lung 31 in cattle, sheep, deer 28
Hydrogen	(see tritium)
Iodine	deposition and retention in plants 43 in cow feed 29 in rumen 26 milk secretion 30 prediction model 33
Krypton	monitoring in air 9
Lead	in cattle 30 in milk 30
Mercury	in cow and milk 30 retention, excretion in human 37
Plutonium	airborne 10

TABLE 4. INDEX TO CAPABILITIES BY POLLUTANT – Continued

Pollutant	Applications (Key numbers refer to Table 5)
Plutonium (cont'd.)	bibliography 24 implant in rodent lung 31 in cattle, sheep, deer 28, 30, 51 in chicken, egg 23 in fungi 25 in milk 30 particle characteristics 10
Polonium	effects 32 in tobacco 32
Radionuclides	analysis 18 concentration factors 34 monitoring 11 quality assurance 47
Radium	in public water supplies 19 reference method, water 17
Radon	from geothermal sources 49 in buildings 39 mill tailings 39
Rubidium	in cow tissue 30 milk secretion 30
Ruthenium	bibliography 40 in plants and soil 40
Strontium	in cattle 28, 51 in sheep and deer 28 reference method, water 17
Tellurium	cow tissue 30 milk secretion 30
Thallium	cow tissue 30 milk secretion 30
Tritium	bibliography 40 effects 42 in cattle 28, 30 in chicken, egg 23 in fish, rabbit 27 in man 37 in plants 41 milk secretion 30 reference material 48 reference method, water 17

TABLE 4. INDEX TO CAPABILITIES BY POLLUTANT – Continued

Pollutant	Applications (Key numbers refer to Table 5)
Tungsten	cow tissue 30 milk secretion 30
Uranium	airborne particles 10 in cattle 28, 51

TABLE 5. CAPABILITIES OF THE ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY-LAS VEGAS

Key	Type of Pollutant	Type of Study	Sources of Pollutant	Subjects or Media Studied	References
1	CO, oxidant	Monitoring network design	Transportation	Atmosphere	1, 2
2	Oxidant	Formation, transport	Urban area	Atmosphere	3, 4, 5, 6
3	Ozone	Laser sensing	Transportation	Atmosphere	7
4	NO_x, hydrocarbons	Airport contribution	Aircraft	Atmosphere, soil vegetation	8
5	Criteria pollutants	Evaluation of networks	Industry	Air, water	9, 32
6	SO_x	Remote and contact monitoring, model validation	Smelters, utilities	Atmosphere	10, 132, 133
7	Particulates	Lidar detection	Urban areas	Boundary layer	11, 12, 13, 14
8	Opacity	Photographic measure	Stack plumes	Atmosphere	15
9	Noble gases	Monitoring, analysis	Nuclear facilities	Atmosphere	16, 17, 18,
10	Plutonium, uranium	Particle characteristics	Nuclear facilities	Atmosphere	19
11	Radionuclides	Environmental monitoring, bioassay	Nuclear tests and facilities	Air, water, milk, food, soil	20 thru 27
12	Trace elements, compounds	Monitoring network design	Landfill, wells	Groundwater	28 thru 33

TABLE 5. CAPABILITIES OF THE ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY-LAS VEGAS
Continued

Key	Type of Pollutant	Type of Study	Sources of Pollutant	Subjects or Media Studied	References
13	Trace elements, compounds	Rapid data analysis	Miscellaneous (STORET data)	Water	34
14	Elements, compounds	Problems and techniques	Non-point sources	Surface water	35, 36
15	Elements, compounds	Monitoring techniques	Oil shale, coal, mineral extraction and processing	Groundwater	37, 38
16	Oil	Remote monitoring	Spills	Water, land, vegetation	39, 40, 41
17	Strontium, radium, tritium alpha, beta, plutonium	Reference methods development	Nuclear reactions	Water, soil	42 thru 46
18	Radionuclides, stable elements	Analytical methods development	Nuclear reactions	Water, air, biota, soil	47, 50, 95
19	Radium	Amount in public water supply	Natural sources	Water	51
20	Nitrates	Control method	Irrigation return flow	Surface water	52
21	Phytoplankton	Monitoring by LANDSAT	Nutrients in lakes	Lakes	53
22	Industrial wastes	Monitoring disposal wells	Industry	Groundwater	54

TABLE 5. CAPABILITIES OF THE ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY-LAS VEGAS
Continued

Key	Type of Pollutant	Type of Study	Sources of Pollutant	Subjects or Media Studied	References
23	Americium, plutonium, tritium	Tissue distribution, egg concentration	Intravenous injection	Chicken, eggs	55, 56, 57
24	Plutonium	Literature review	Nuclear industry	Biological systems	58
25	Plutonium	Solubility by microorganisms	Contaminated soil	Microbiota	59
26	Plutonium, americium, iodine	Solubility in rumen contents	Solutions, particles	Artificial rumen	60, 61
27	Tritium	Tissue concentration	Feed and water	Fish, rabbit	62, 63
28	Radioactive fallout	Tissue distribution, effects	Pasture, range	Cattle, sheep, deer	64 thru 69
29	Iodine	Effect of feed on milk secretion	Alfalfa, Sudan grass	Dairy cow	70
30	Uranium, plutonium, americium, tungsten, thallium, rubidium, tellurium, tritium, iodine, lead, mercury, beryllium, iron, curium	Tissue distribution, milk secretion	Oral and intravenous administration, feed	Dairy cow, goat	71 thru 84, 134
31	Fission products, plutonium	Dose and effect relationship	Single particle implanted in lung	Hamster	85, 86

TABLE 5. CAPABILITIES OF THE ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY-LAS VEGAS
Continued

Key	Type of Pollutant	Type of Study	Sources of Pollutant	Subjects or Media Studied	References
32	Polonium	Lung cancer	Tobacco smoke	Rat	87, 88
33	Radioiodine	Prediction model	Nuclear tests	Human child	89
34	Radionuclides	Literature review	Nuclear industry	Concentration factors	90
35	Sand	Retention by grain size	Oral dosing	Dairy cow	91
36	Organophosphate	Biological detection	Pesticides	Livestock, wildlife	92
37	Mercury, tritium	Retention, excretion	Atmosphere	Man	93, 94
38	Lead, cadmium, mercury	Area balance, body burden, monitoring system	Industry, transportation	Man	95 thru 99
39	Mill tailings	Human hazard	Uranium mills	Construction materials	100
40	Americium, ruthenium, tritium	Literature review	Nuclear industry	Soil and plants	101 thru 103
41	Tritium	Organic labelling	Water, atmosphere	Alfalfa, lettuce	104, 105
42	Tritium	Chromosome effect	Water	Soybean leaf	106
43	Iodine, tritium	Deposition, retention, and literature review	Aerosols, gas, solution	Alfalfa, Sudan grass, miscellaneous	107 thru 111

TABLE 5. CAPABILITIES OF THE ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY-LAS VEGAS
Continued

Key	Type of Pollutant	Type of Study	Sources of Pollutant	Subjects or Media Studied	References
44	Mercury	Conversion to organic form	Inorganic solution	Pea, tobacco, soil	112 thru 115
45	Nitrate, phosphate	Lake eutrophication	Point and non-point sources	Phytoplankton	116 thru 119
46	Industrial wastes	Remote sensing of effect	Industry	Land and land use	120
47	Radionuclides	Quality assurance	Fallout, nuclear facilities	Radiation monitoring	121 thru 126
48	Tritium	Standard reference materials	Nuclear reactors	Alfalfa	127
49	Hydrogen sulfide, radon	Sampling of effluents	Geothermal sources	Various	128, 129
50	Organic compounds	Survey of poisonous plants	Plant biochemistry	Nevada Test Site	130
51	Plutonium, uranium	Uptake in range cattle	Nuclear safety tests	Cattle	131

DEVELOPING CAPABILITIES

Projects currently in progress, as of January 1977, at the Las Vegas Laboratory reflect the capabilities under development or being improved. These projects are listed in Table 6 by medium and pollutant.

Some of this work is being performed under contract; other work is being conducted in house. Some of the current projects are relatively new, but most are extensions of previous projects and are designed to confirm, extend, or improve tentative results of previous work. In many instances, the methodology under study may be applied to difficult or peculiar technical support situations to test the efficiency and cost-effectiveness of new methodology.

TABLE 6. PROJECTS INDICATIVE OF DEVELOPING CAPABILITIES

Medium	Pollutant	Purpose of Study
Air	Baseline levels	Measure baseline air concentrations in proposed energy development areas
	Baseline levels	Determine vertical distributions of pollutants to validate regional-scale models
	Carbon monoxide, oxidant	Develop guidelines for optimization of air monitoring networks and field test the guides
	Criteria pollutants	Helicopter use for downwind and vertical distribution of pollutants in urban areas
	Nitrogen oxides, carbon monoxide, hydrocarbons	Assess effect of aircraft operations on air quality; validate models
	Opacity	Compare photographic with trained-observer estimates of stack plume opacity
	Particulates	Develop two-wavelength lidar system for remote measurement of particulates; develop laser transmisometer for quantifying visibility degradation
	Plutonium	Detection of possible resuspension of plutonium from contaminated areas

TABLE 6. PROJECTS INDICATIVE OF DEVELOPING CAPABILITIES
Continued

Medium	Pollutant	Purpose of Study
Air (cont'd.)	Sulfur and nitrogen oxides, ozone	Dual monitoring system to validate dispersion models
	Sulfur dioxide	Develop laser system for remote monitoring
	Sulfur dioxide, ozone	Develop differential absorption system for remote monitoring
	Sulfur, nitrogen, and carbon oxides	Develop passive infrared sensor for remote monitoring
	Sulfur oxides, carbon monoxide, ozone	Check calibration of State and local air monitoring stations
Water	Algae	Develop laser fluorosensor to detect chlorophyll and dye dispersions for remote monitoring of trophic condition
	Algae	Evaluate LANDSAT multispectral techniques for estimating trophic state of inland lakes
	Algae	Identify phytoplankton in 747 National Eutrophication Survey lake samples to the species level and do differential counts
	Algae, nutrients	In-depth analysis of National Eutrophication Survey data for relationship of lake biological response to water-quality data
	Coliform bacteria, other water-quality parameters	Develop automated in situ sensor/sampler package for small boat or aircraft deployment
	Harbor-related pollutants	Develop photographic imagery keys for typical harbor pollution problems
	Hazardous materials	Develop a procedures manual for use by hazardous-spill response teams; develop a helicopter-borne system for assessment of river sediments
	Leachate from landfills	Develop photographic imagery keys for detection and analysis
	Non-point sources	Develop photographic imagery keys for identification and analysis in agriculture, silviculture, and industry-related problems
	Non-regulated pollutants	Identify pollutants of near-term interest, evaluate monitoring techniques, correct deficiencies

TABLE 6. PROJECTS INDICATIVE OF DEVELOPING CAPABILITIES
Continued

Medium	Pollutant	Purpose of Study
Water (cont'd.)	Oil-shale residues	Describe and validate optimal water monitoring techniques for assessing impact of oil-shale development
	Organics	Correlate laser-excited fluoresence with total organic carbon in surface water
	Pesticides, nutrients	Determine general water-quality baseline data for the Atchafalaya Basin
	Pesticides, nutrients	Determine net nutrient production and export in the Atchafalaya Basin
	Physical, chemical, biological	Assess present status of the San Juan Basin prior to energy facility development
	Turbidity	Develop multispectral techniques for remote monitoring of sediment in water
	Water-quality parameters	Compile an atlas of water monitoring networks in western energy development areas
	Water-quality parameters	Assess the quality and adequacy of water data in river basins and aquifers of the western energy development areas
	Water-quality parameters	Evaluate required sampling frequency to accurately determine short-term trends in water quality
	Water-quality parameters	Validate published methodology for monitoring changes in groundwater quality
	Water-quality parameters	Develop and validate groundwater monitoring strategies in strip-mined and oil-shale areas
Soil	Energy-related pollutants	Develop overhead monitoring to assess impact of new energy developments on land use, surface water, and vegetation
	Mercury	Determine the kinetics and pathways of methylmercury formation in various soils
Biological systems	Aircraft-related pollutants	Measure the impact of airport operations on local plants and soils
	Carcinogens	Develop model relating exposure monitoring to individual or average dose for carcinogens
	Carcinogens	Establish optimum system for identification and quantification of sources, to evaluate pathways and transformations, and to

TABLE 6. PROJECTS INDICATIVE OF DEVELOPING CAPABILITIES
Continued

Medium	Pollutant	Purpose of Study
	Carcinogens (cont'd.)	develop other data requirements for integrated monitoring
	Carcinogens	Develop methods for retrospective estimation of human exposure
	Geothermal effluents	Develop monitoring strategy for impact of geothermal development on local ecology
	Lead, cadmium	Develop relatively rapid bioassay systems for measuring exposure to lead and cadmium
	Mercury	Determine chemical forms and pathways of mercury in economic plants, for both foliar and root uptake
	Neptunium, plutonium, americium, curium	Test solubility in artificial rumen as an estimator of in vivo uptake
	Plutonium oxide, neptunium	Measure uptake, transfer to milk, and tissue distribution in dairy cattle
	Radionuclides	Sample wildlife and cattle on and around the Nevada Test Site to measure trends in tissue concentration
	Sulfur and nitrogen oxides, ozone	Develop laser fluorosensing techniques for measuring vegetation stress
	Sulfur dioxide	Develop photographic imagery keys for identifying vegetation stress
	Trace elements	Identify and validate biological monitoring systems for measuring lead and cadmium exposure
	Trace metals	Design an integrated monitoring system which correlates all exposure routes
	Various	Determine applicability of the Fraunhofer Line Discriminator as a detector of vegetation stress

FURTHER INFORMATION

Further information on specific projects or capabilities of the Environmental Monitoring and Support Laboratory-Las Vegas is available from the Laboratory Director and from the Directors of the Laboratory's Divisions and Staff Offices. These persons may be reached at the address and telephone number shown in Figure 1.

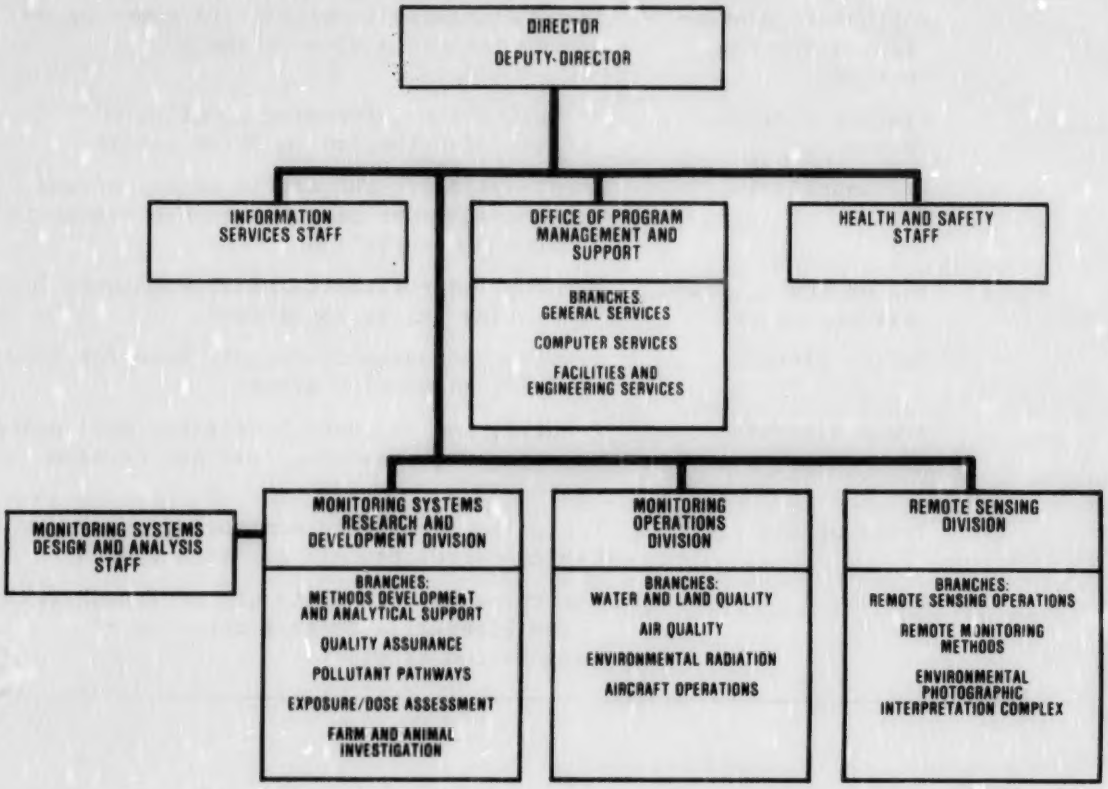

Figure 1. Organization of the Environmental Monitoring and Support Laboratory-Las Vegas, located at 944 E. Harmon Avenue (Mailing address: P. O. Box 15027, Las Vegas, NV 89114; telephone: 702-736-2969, FTS 595-2969)

Arrangements for technical support within available resources may be made with the Laboratory Director or the Director of the appropriate Division. State and local agencies should contact the Office of Research and Development (ORD) Representative at the EPA Regional Office which serves their State to request appropriate technical support from the Las Vegas Laboratory. Their addresses are listed below.

Some of the references listed in this report are available from the authors. Many may be ordered in microfiche or hard copy from the National Technical Information Service in Springfield, Virginia, and others will be found in the periodical literature. The Las Vegas Laboratory's library or its Information Services Staff can assist in locating a particular document or determining its current availability.

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